AP Calculus AB
Test: Bridge to Calculus
Instructor's Version

Free-Response Question 1--no calculator (worth 15 points)

1. Given that $f(x) = x^2 - 2x$ and that $g(x) = \sqrt{x-15}$:

A. State $(g \bullet f)(x)$ and $(g + f)(x)$.

Answer: $(g \bullet f)(x) = (x^2 - 2x)\sqrt{x-15}$ (2 points)
and $(g + f)(x) = (x^2 - 2x) + \sqrt{x-15}$ (2 points)

B. Find all vertical asymptotes of $(g/f)(x)$:

Answer: This problem has no vertical asymptotes because the zeros of the denominator ($x = 0$ and $x = 2$) are not in the domain of g/f. (1 point for each zero; 1 point for the correct conclusion)

C. Determine the domain of $(g \circ f)(x)$:

Answer: $(-\infty, -3] \cup [5, \infty)$ (3 points)
$(g \circ f)(x) = \sqrt{x^2 - 2x - 15}$ (2 points) plus explanation that discusses undefined behavior on the interval (-3, 5).

D. Determine the range of $(g \circ f)(x)$:

Answer: $[0, \infty)$ (2 points)

Explanation that negative range values are not possible as the result of the "principal" square root. (2 points)

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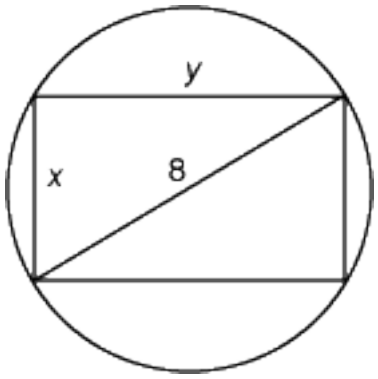
Free-Response Question 2--with calculator (worth 15 points)

2. A rectangle is inscribed in a circle as shown. The diameter of the circle and the diagonal of the rectangle are both 8 meters.



A. Express the length of the side y of the rectangle as a function of the side labeled x.

Answer: $x^2 + y^2 = 64$, or its equivalent (3 points)
$y=\sqrt{64-x^2}$ since y is always positive (1 point)

B. Write an expression to represent the area of the rectangle, $A(x)$.

Answer: $A(x) = x\sqrt{64-x^2}$ (4 points)
[Note: 4 points if $A = xy$ with incorrect y from part A].

C. Determine the domain of $A(x)$.

Answer: (0, 8) (2 points)
Explanation: lengths of sides and area cannot be negative values (2 points)
[Note: 4 points for [-8, 8] or [0, 8] with appropriate explanations. Note that at 0 and 8, no rectangle exists.]

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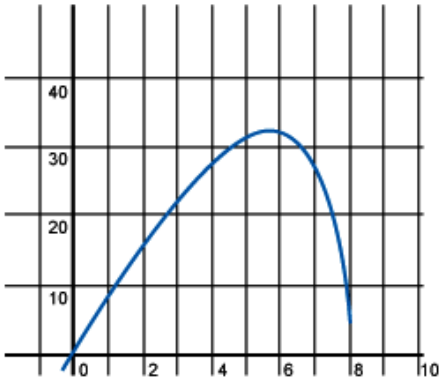
D. Graph $A(x)$.

Graph is worth 1 point.



E. In your own words, interpret the meaning of the function graph of $A(x)$.

Answer: Initially, the area of the rectangle increases until the length of the side x is between 5 and 6 meters. After that mark, the area begins to decrease until it reaches zero. Other valid interpretations may be awarded full credit. (2 points)

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